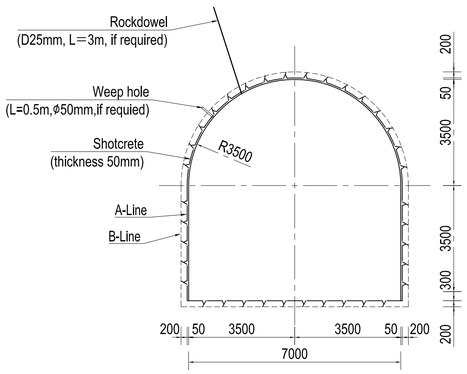
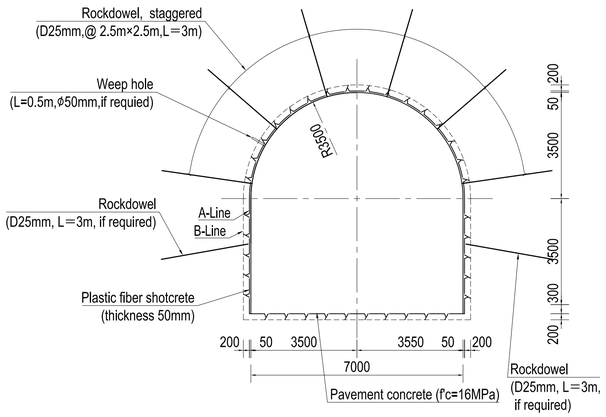
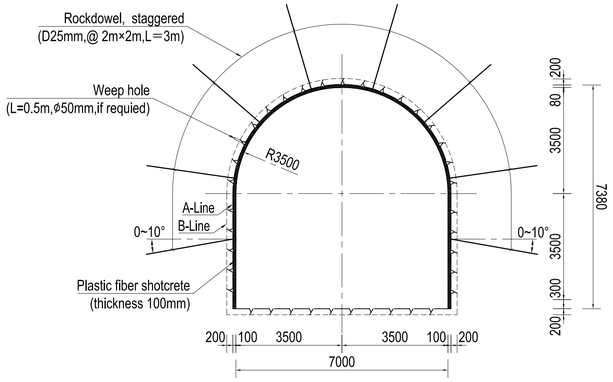
## SUPPORT TYPE OF ROCK CLASS I
1:100



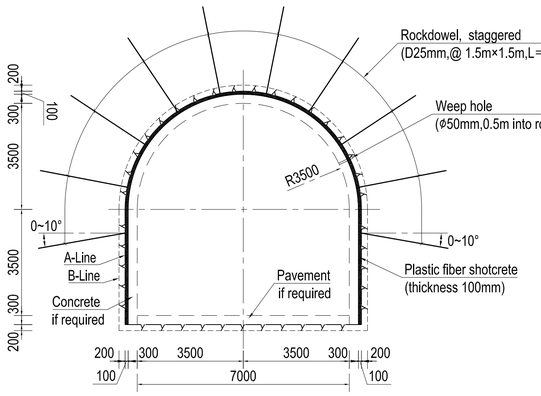

## SUPPORT TYPE OF ROCK CLASS II
1:100



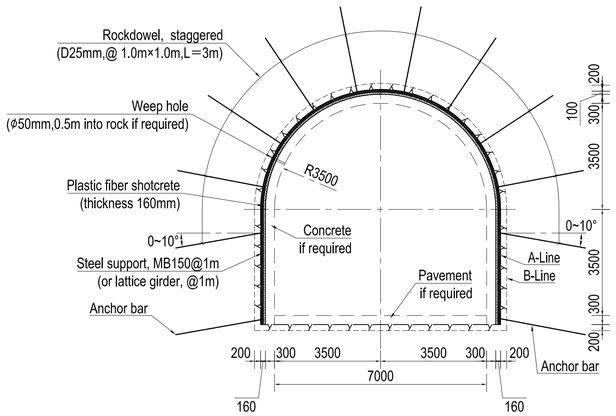

## SUPPORT TYPE OF ROCK CLASS III
1:100



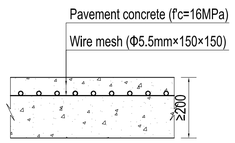

## SUPPORT TYPE OF ROCK CLASS IV
(WITHOUT STEEL SUPPORT) 1:100




## SUPPORT TYPE OF ROCK CLASS IV
(WITH STEEL SUPPORT) 1:100




## DETAIL OF PAVEMENT CONCRETE
1:10




Scale 1:100 0 1 2 3 4 5m

Scale 1:10 0 0.1 0.2 0.3 0.4 0.5m

## NOTE

1. Coordinates, chainages & elevations are measured in meters, diameter is millimeter, dimensions are in millimeter unless otherwise specified.
2. The excavation and support methods can be adjusted according to the actual situation after the geological conditions are revealed.
3. It is evident that the maximum unsupported span is a guideline, only, and needs continuous adjustment to the prevailing rock conditions and construction requirements at the spot.
4. The cylinder specified compressive strength of tunnel shotcrete and cement mortar at 28 days of age is 25MPa.
5. The specified compressive strength of concrete is the cylinder strength at age of 28 days.
6. The yield strength of steel is 250MPa.
7. Rust preventive compound will be sprayed on exposed surface of steel structure.
8. Symbol description:
   A-Line is the design excavation line.
   B-Line is the overbreak line.
   R denotes round bar, yield strength of the round bar is 280MPa.
   D denotes deformed bar, yield strength of the deformed bar is 500MPa;
9. The forepoling is mainly used in the tunnel section with poor surrounding rock geology, which should be used together with dowel and steel support （or lattice girder）, and the spacing of dowel should be consistent with that of steel support.
10. The detail of weep holes, rock dowel, steel support and steel lattice girder see the drawing No. UT1-C-000-CVL-DG-40001.
11. The steel support （or lattice girder）to rock class V / IV is subjected to the exposed geological condition.

## REFERENCE DRAWINGS

| | |
|---|---|
| UT1-C-000-CVL-DG-40001 | Detailed Design Drawing of Excavation and Support for Underground Cavern |
| UT1-C-060-CVL-DG-43001 | Layout Drawing of Work Adit for Steel Penstock Tunnel |
| UT1-C-090-CVL-DG-64001 | Layout of Access Tunnel to Powerhouse |

## SYMBOL AND LEGEND

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|---|---|---|---|---|---|
| 0A | 15.JUN.2022 | First issue | Han Y.H. | Lei Y.G. | Luo L. Zhou L.S. |

PROJECT TITLE

Upper Trishuli-1 HEP (216MW)

OWNER

NWEDC NEPAL WATER AND ENERGY DEVELOPMENT CO. PVT. LTD.

OWNER'S ENGINEER

TRACTEBEL ENGIE jade CONSULT

CONTRACTOR

DOOSAN Enerbility

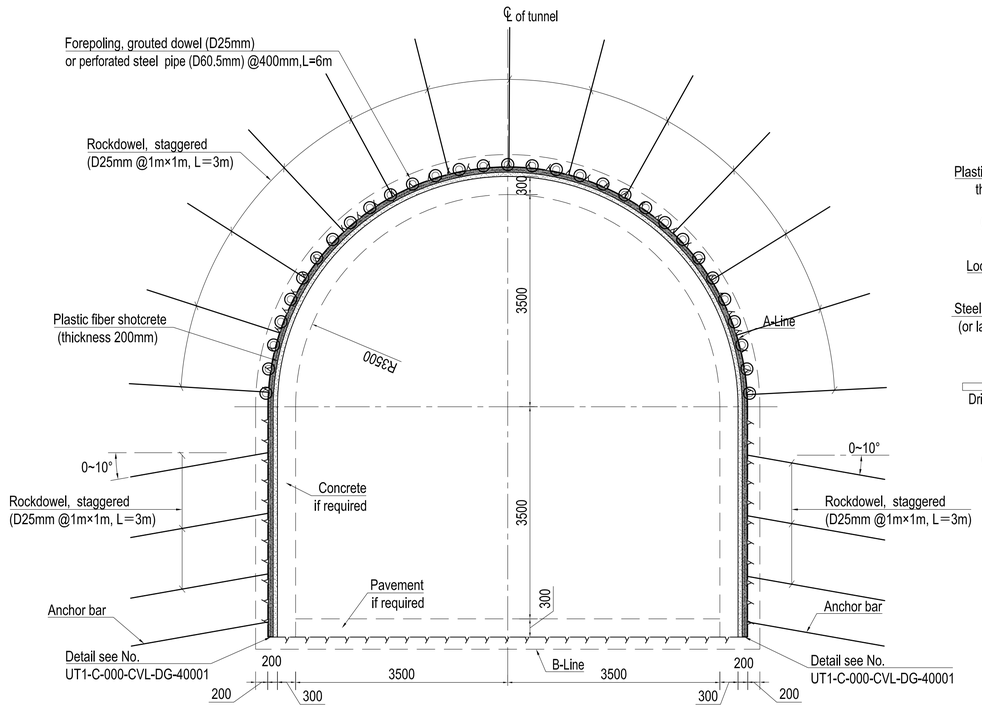
DRAWING TITLE

Excavation and Support Drawing of Work Adit for Steel Penstock Tunnel

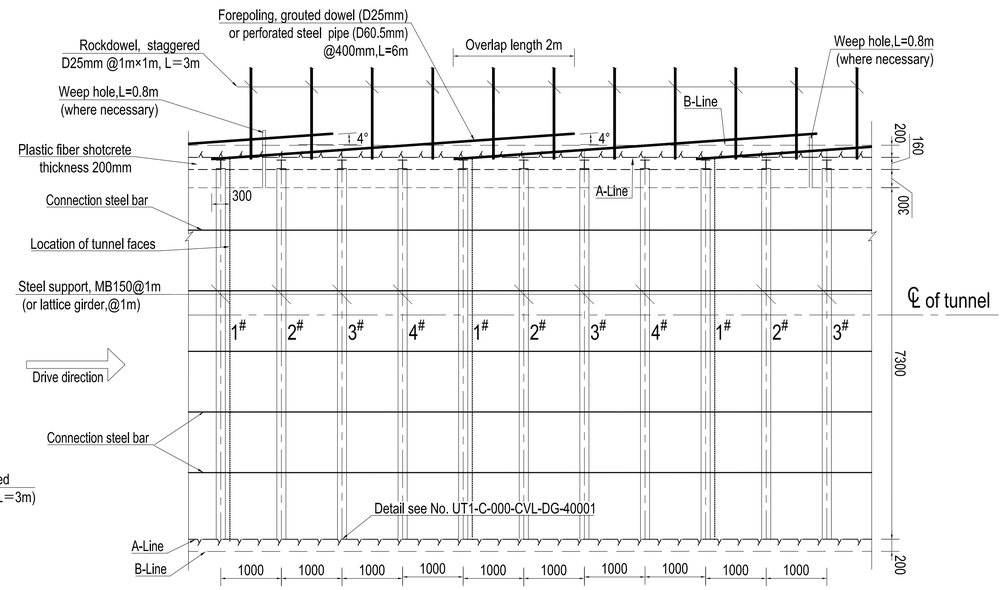
| INDEX | DRAWING NUMBER | SHEET NO. | REV. NO. |
|---|---|---|---|
| A | UT1-C-060-CVL-DG-43002- 01 | 1 OF 3 | 0A |

A1 (594 x 841 MM)

## ACROSS SECTION OF FOREPOLING
(Applied to Rock Class V) 1:50




## LONGITUDINAL SECTION OF FOREPOLING
(Applied to Rock Class V) 1:50




NOTE: (1)The gaps behind the steel ribs need always be filled with shotcrete and/or concrete, not with rock blocks.
(2)The excavation profile may need to be adjusted to a "saw-tooth profile" and size of ribs/girders may also be adjusted.

## TUNNEL SUPPORT PATTERN

| Rock mass quality | 40≥Q | 10≤Q<40 | 4≤Q<10 | 1≤Q<4 | | Q<1 |
|---|---|---|---|---|---|---|
| Support type | I | II | III | IV (Without steel support) | IV (With steel support) | V Same as type IV (With steel support) |
| Inner dimension(m) | W=7m，H=7m | | | | | |
| | Excavation Parameter | | | | | |
| ESR | 1.3 | 1.3 | 1.3 | 1.3 | | 1.3 |
| Excavation span(m) | 3 | 3 | 2 | 1.5 | | 0.5~1 |
| Calculated MUS*(m) | 11 | 9 | 5 | 3 | | 1 |
| MUS* for shotcrete application(m) | | 9 | 2 | 1.5 | | 1 |
| MUS* for rock dowel installation(m) | | 6 | 4 | 3 | | 0.5~1 |
| MUS* for steel support installation(m) | | | | 0.5~1.0 | | 0.5~1 |
| Excavation method | | | Blasting | Blasting/mechanically | | Mechanically |
| Initial support parameters | | | | | | |
| Weep hole Φ50mm,0.5m into rock | where necessary | | | | | |
| Plastic fiber shotcrete,f'c=25MPa | T=50mm | T=50mm | T=100mm | T=100mm | T=160mm | For class V rock, the same support scheme as class IV rock can be adopted after grouting is used to improve the integrity and firmness of surrounding rock. |
| Rock dowel D25,L=3m,alternately | Spot | @2.5m×2.5m | @2m×2m | @1.5m×1.5m | @1.0m×1.0m | |
| Steel support, MB150 (or lattice girder) | | | | | @1m | |
| Forepoling grouted dowel,D25mm, @400mm, L=6m | | | | | where necessary | |
| *MUS，Maximum Unsupported Span. | | | | | | |

Scale 1:50 0 0.5 1 1.5 2 2.5m

NOTE

1. All dimensions are in millimeters, and coordinates, chainages & elevations are in meters.
2. Other notes please refer to sheet 1.

REFERENCE DRAWINGS

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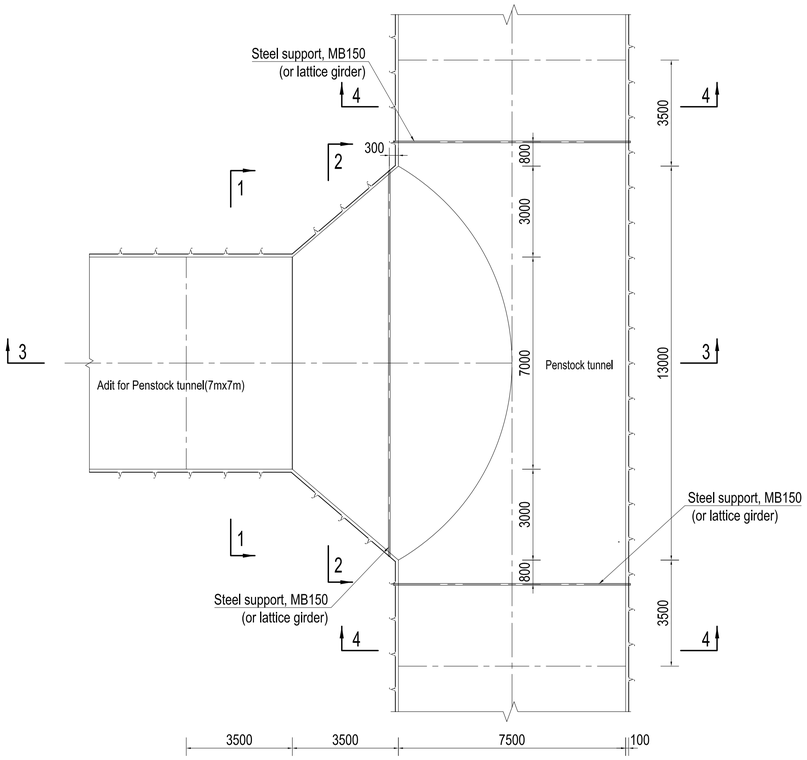
|---|---|---|---|
| A | UT1-C-060-CVL-DG-43002- 02 | 2 OF 3 | 0A |

A1 (594 x 841 MM)

# PLAN OF BRANCH OF ADIT & PENSTOCK TUNNEL

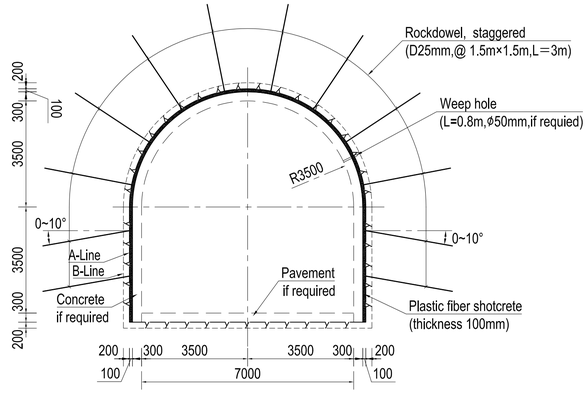
SCALE 1:100




NOTE: The steel ribs at the start and end of the branch are only required in Class III & IV.

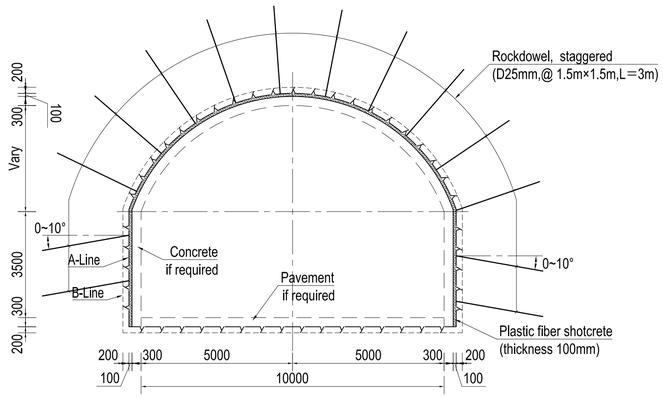
# SECTION 1-1

SCALE 1:100



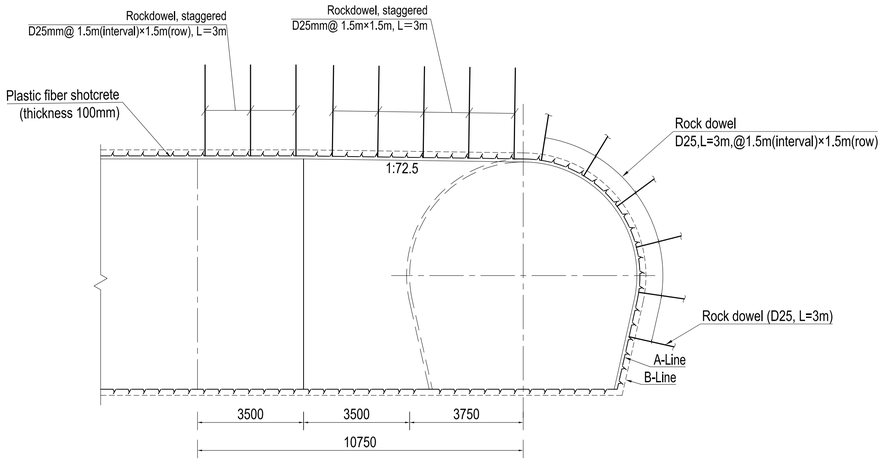

# SECTION 2-2

SCALE 1:100



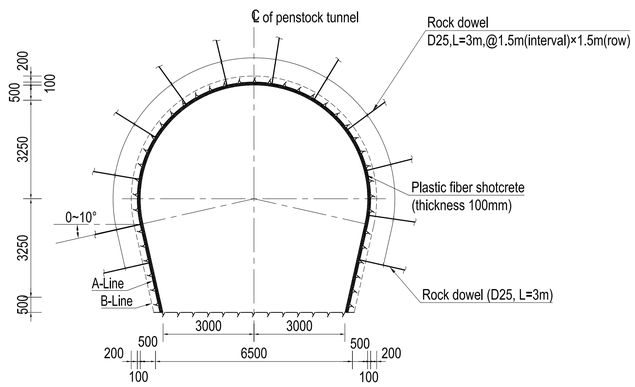

# SECTION 3-3

SCALE 1:100




# SECTION 4-4

SCALE 1:100




Scale 1:100 0 1 2 3 4 5m

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1. All dimensions are in millimeters, and coordinates, chainages & elevations are in meters.
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